



LTPP North Central Regional Office

505 West University Avenue - Champaign, IL 61820-3915 - Tel 800 344-7477 - Fax 217 356-3088 - www.ncrco.com

May 9, 2001

Mr. Jack Springer, HRDI-13
FHWA-LTPP
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

Re: SPS Construction Report for SPS-8 south of Ozark, Missouri

Dear Mr. Springer,

I have enclosed a copy of the SPS construction report for the SPS-8 near Ozark, Missouri. Reports for the remaining projects in Missouri will be completed in the near future, and sent to you as they are available. Please let me know if you have any comments or questions concerning this report. You may contact me at 217/356-4500.

Sincerely,

Brenda B. Mehnert
ERES Division of ARA, Inc.

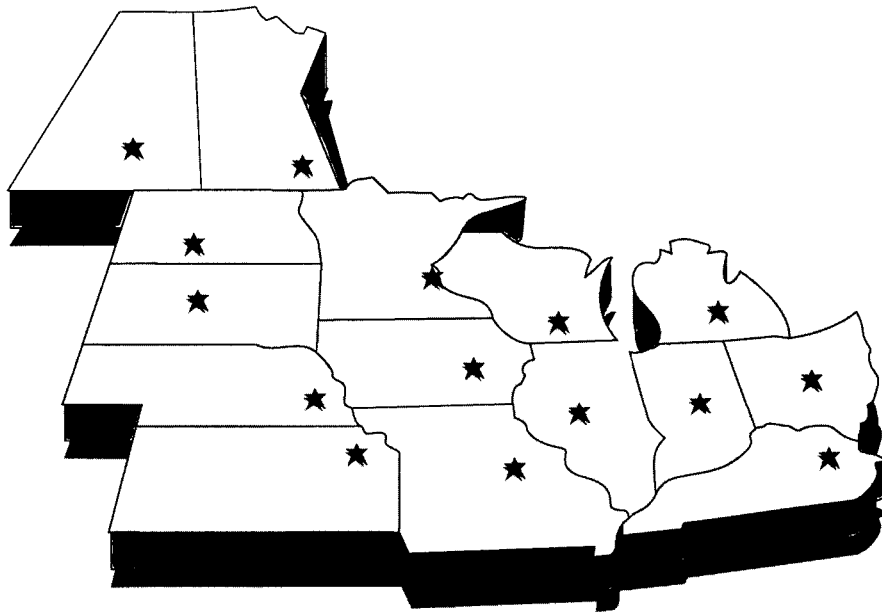
Enclosures:

cc: M. Symons (FHWA-COTR)
J. Jiang (LTPP-DATS)

Construction Report for Missouri SPS-8

DTFH61-96-C-00013

May 1, 2001



**SPS-8 Construction Report
Christian County, Missouri
Frontage Road West of US 65
(approximately 6 km south of Ozark, Missouri)**

Sections 290801, 290802, 290807, and 290808

**Federal Highway Administration
LTPP Division
North Central Region**

**Report Prepared By:
Brenda B. Mehnert**

**ERES Consultants
A Division of Applied Research Associates, Inc.
505 West University Ave.
Champaign, Illinois 61820**

May 1, 2001

TABLE OF CONTENTS

1 PROJECT OVERVIEW	1
1.1 EXPERIMENT CELL.....	1
1.2 PROJECT LOCATION	1
1.3 PROJECT LAYOUT	1
1.4 TRAFFIC CHARACTERISTICS	2
1.5 LIMITS OF TEST SECTIONS	2
1.6 WEATHER MONITORING	2
1.7 TRAFFIC MONITORING	2
1.8 PERSONNEL.....	2
1.9 KNOWN DEVIATIONS FROM GUIDELINES	4
1.10 SUMMARY OF KEY CONSTRUCTION EQUIPMENT.....	4
2 PROJECT DETAILS	5
2.1 DESIGN FEATURES	5
2.2 MATERIAL SAMPLING AND TESTING.....	5
2.3 CONSTRUCTION ACTIVITIES.....	5
2.4 SUBGRADE PREPARATION	5
2.5 PLACEMENT OF BASE LAYER	6
2.6 ASPHALT PAVING.....	6
2.7 CONCRETE PAVING.....	6

ATTACHMENTS

..

ATTACHMENT A: PROJECT LOCATION

ATTACHMENT B: SITE LAYOUT

ATTACHMENT C: MATERIAL SAMPLING AND TESTING PLAN

ATTACHMENT D: LAYER DESCRIPTION AND THICKNESS FOR EACH SECTION

ATTACHMENT E: PROJECT DEVIATION REPORT

1 Project Overview

The Strategic Highway Research Program (SHRP) SPS-8 project investigates environmental effects on both rigid and flexible pavements in the absence of heavy loads. This project encompasses both types of structures built on conventional nondrained base materials over three types of subgrade. The factors addressed on the long-term pavement performance of these two types of pavements are:

- Pavement type
- Layer thickness
- Subgrade soil types

The analysis of information developed from this experiment will provide substantially improved data for validation and improvement of the environmental effects models used in the design of rigid and flexible pavements.

Four test sections were constructed for this project, two flexible and two rigid pavement. The flexible pavements consisted of varying base layer thickness and asphalt concrete surface. The rigid pavements had the same base thickness but different PCC surface layer thickness. All the sections were constructed with the same type of base layer and subgrade—crushed stone over a fine-grained subgrade.

This report summarizes the “as-built” pavement layers of the Missouri SPS-8 site that include four SHRP test sections constructed in the late spring 1998 and completed by July 1998. Field tests were performed, and laboratory samples obtained and analyzed, at different stages of construction from each test section. All samples were taken from the southbound lane.

1.1 Experiment Cell

This Missouri SPS-8 experiment is located in the wet-freeze environmental zone and was constructed on a fine-grained subgrade. The existing pavement was removed to accommodate the new pavement structure. The existing pavement was 102 mm of asphalt concrete (AC) placed on 178 mm of crushed rock base placed on a silty sand subgrade following the 1986 AASHTO Structural Design Method.

1.2 Project Location

The Missouri SPS-8 project is located in the southbound lane of the frontage road west of US Highway 65 (US-65) in Christian County, Missouri. This site is approximately 6 km south of Ozark, Missouri, and just west of Selmore, Missouri. Attachment A is a general project location map.

The test site is located on a 3.0 percent downgrade. The horizontal curvature for both sections is tangent. The lanes are 3 m wide and have asphalt concrete shoulders that are 1.2 m wide. The shoulders were constructed with 102 mm of AC on a 203-mm base of crushed stone.

1.3 Project Layout

Attachment B contains the test section layout that summarizes surface thickness and layer descriptions.

1.4 Traffic Characteristics

This two-lane section of frontage road is classified as a local road. Table 1 shows traffic data at the time of construction.

Table 1. Traffic data for Missouri SPS-08.

Annual Average Daily Traffic (two directions)	50 Vehicles
Design Period (years)	20

1.5 Limits of Test Sections

Table 2 shows the limits of the test sections at the SPS-8 site. Each test section includes a monitoring section of 152 m and 15 m at each end of the monitoring section to be used as sampling areas.

Table 2. Limits of Missouri SPS-8 test sections.

Test Section #	Test Section		500-ft Monitoring Section	
	Beginning Station	End Station	Beginning Section	End Station
290801	454+50	460+50	455+00	460+00
290802	461+00	467+00	461+50	466+50
290808	467+50	474+00	468+00	473+00
290807	474+00	480+00	474+50	479+50

1.6 Weather Monitoring

An automatic weather station (AWS) unit was installed February 2000 inside the Missouri DOT maintenance yard in Ozark. This unit is approximately 6 km from the SPS-8 site.

1.7 Traffic Monitoring

There was no traffic monitoring device installed near this site.

1.8 Personnel

North Central Regional Coordination Office

ERES Consultants, a Division of ARA, Inc.
Tom Wilson
Principal Investigator
505 West University Avenue
Champaign, Illinois 61820 (800) 344-7477

Material Testing

Braun Intertec Corporation
Bruce M. Thorson, PE or David Clauson
LTPP Testing Contractor
P.O. Box 39108
Minneapolis, Minnesota 55439-0108 (612) 941-4151

Jason Blomberg
Research, Development and Technology
Missouri Dept. of Transportation
105 West Capitol Avenue
Jefferson City, MO 65102 (573) 751-2551 and Fax (573) 751-6555
www.modot.state.mo.us

Field Sampling and Testing

Jason Blomberg
Research, Development and Technology
Missouri Dept. of Transportation
105 West Capitol Avenue
Jefferson City, MO 65102 (573) 751-2551 and Fax (573) 751-6555
www.modot.state.mo.us

LTPP Design Review

John Miller
PCS/LAW
A Division of Law Engineering and Environmental Services, Inc.
2104 Indian Creek Court, Suite A
Beltsville, Maryland 20705 (301) 210-4105

State Department of Transportation

Jason Blomberg
Research, Development and Technology
Missouri Dept. of Transportation
105 West Capitol Avenue
Jefferson City, MO 65102 (573) 751-2551 and Fax (573) 751-6555
www.modot.state.mo.us

Construction Contractor

Leo Journagan
Journagan Construction Co., Inc.
3003 E. Chestnut Expressway
Suite 1200
Springfield, MO 65802 (417) 839-2173

1.9 Known Deviations from Guidelines

Attachment E contains project deviation reports filled out during and after construction.

1.10 Summary of Key Construction Equipment

Subgrade Preparation

- 5.0-ton sheepsfoot

Crushed Stone Preparation

- Single drum vibrator (10.0-ton)

Asphalt Concrete Pavement Placement

- Cedar Rapids (model CR461P) paver
- 10.3-ton steel wheel tandem roller
- 10.1-ton pneumatic rubber-tired roller
- 10.2-ton double drum vibrator @ 1.7mph
- Asphalt concrete drum mix plant

PCC Placement

- Gomaco, Commander 3 paver
- Portland cement concrete mix plant

2 Project Details

Project meetings were held at the District 8 Office Complex in Springfield, Missouri, in August 1996. Representatives from the contractor, sub-contractors, LTPP, and Missouri DOT attended these meetings. Preparation of the subgrade did not begin until March 1998. Construction was completed in July 1998.

2.1 Design Features

Table 3 summarizes the asphalt, concrete, and base layer thickness for each section. Edge drains were not installed in any of the sections.

Table 3. Summary of material thickness and edge drains for each section.

Test Section Number	Surface Thickness (mm) (Surface)	Material and Thickness (mm) (Crushed Stone Base)	Edge Drains
290801	125 AC	198	No
290802	191 AC	292	No
290808	269 PCC	160	No
290807	193 PCC	160	No

2.2 Material Sampling and Testing

Locations of material sampling and field testing for each layer are given in attachment C. LTPP sampling field testing procedures have been developed specifically for the SPS-8 program, and all activities were performed in accordance with these guidelines unless noted in attachment E. Samples for laboratory testing were sent to Braun Intertec and the Missouri Department of Transportation.

2.3 Construction Activities

Removal of the existing pavement for this project began in early 1998. The end sections, 290801 and 290807, were located in fill areas, whereas sections 290802 and 290808 were located in cut and fill areas. Subgrade preparation followed shortly thereafter. Paving operations were completed by mid-July 1998.

2.4 Subgrade Preparation

Subgrade preparation began October 15, 1996, and was completed December 14, 1996. A 5.0-ton sheepsfoot was used for compacting the subgrade. Sections 290801 and 290807 were both in fill sections. Sections 290802 and 290808, located in the center of the project, were in cut and fill sections. Both sections were reconstructed with a typical subgrade lift thickness of 203 mm. The

flexible sections (290801 and 290802) were constructed on a 0.86 percent vertical downgrade. A 0.3 percent vertical downgrade was maintained for the rigid sections (290807 and 290808).

2.5 Placement of Base Layer

Preparation of the unbound base layer began on May 5, 1998, and was completed by June 6, 1998. For sections with a 178-mm base, the first and second lift thicknesses were typically 127 mm and 76 mm, respectively. Section 290802 (with the 279-mm base) had three lifts—127, 76, and 102 mm. The lift thickness represents the thickness before a 10.7-ton single drum vibrator roller was used for compaction.

2.6 Asphalt Paving

Paving operations began June 3, 1998, and completed the next day. Two asphalt concrete mixes are used in these two flexible pavement test sections, the binder course and surface course. The Journagan Drum Mix Plant, located 20 minutes from the site, produced the hot mix asphalt concrete (dense graded) for this site. Placement of the asphalt concrete was performed with a Cedar Rapids, model CR 461P paver with a laydown width of 3 m. There was one longitudinal surface joint located between the lanes. The mean laydown temperature of the asphalt was 135°C, and the air temperature was 27°C. The first layer was allowed to cure for 1 day while the final layer was allowed to cure for approximately 20 days.

The AC binder course was placed before the final AC surface. A minimum compacted thickness of 58 mm for the first lift was maintained for both the AC binder and surface course. For section 290801, the minimum compacted thickness for the second lift was 46 mm, and the minimum compacted thickness for section 290802 first lift was 58 mm. The mean laydown temperature of the asphalt was 136°C, and the air temperature was 27°C.

Typically, for the AC surface layers, breakdown compaction was performed with two passes of an 10.2-ton double drum vibrator. Two passes with a 10.1-ton pneumatic-tired roller were used for the intermediate compaction. Lastly, a 10.3-ton steel-wheel tandem roller made the final two passes.

2.7 Concrete Paving

The paving operation began May 20, 1998, and was completed the same day. The concrete mix plant used was Conco, located 15 miles away, for a haul time of 30 minutes. A Gomaco Commander 3 form paver was used at this site. A 6-m width was paved in one pass. Twelve vibrators were placed 457 mm apart and 102 mm below the surface.

One mix design was used for this project. Type 1 cement was used with two admixtures, air-entraining admixture (AASHTO M154) and a retarding admixture (AASHTO M194, Type B). The coarse aggregate was made of 100 percent crushed stone, and the fine aggregate was composed of 100 percent natural sand. The consolidation of materials was attained with vibrating screeds and finishing was completed by hand-troweling. A membrane-curing compound was used, and the surface was textured using a tine.

The surface was profiled June 10, 1998, using a California type Profilograph with a 0.0-in blanking band. No diamond surface grinding was necessary, as the profile index was 27 in/mile.

The average contraction joint spacing was 5 m. Spaced every 4-m were dowels coated with epoxy. These dowels were 457 mm long with a 32-mm diameter. These were installed using preplaced baskets. Transverse joints were sawed to a 51-mm depth and sealed with low-modulus silicone. The longitudinal joint was also sawed along the weakened plane.

Attachment A
Project Location

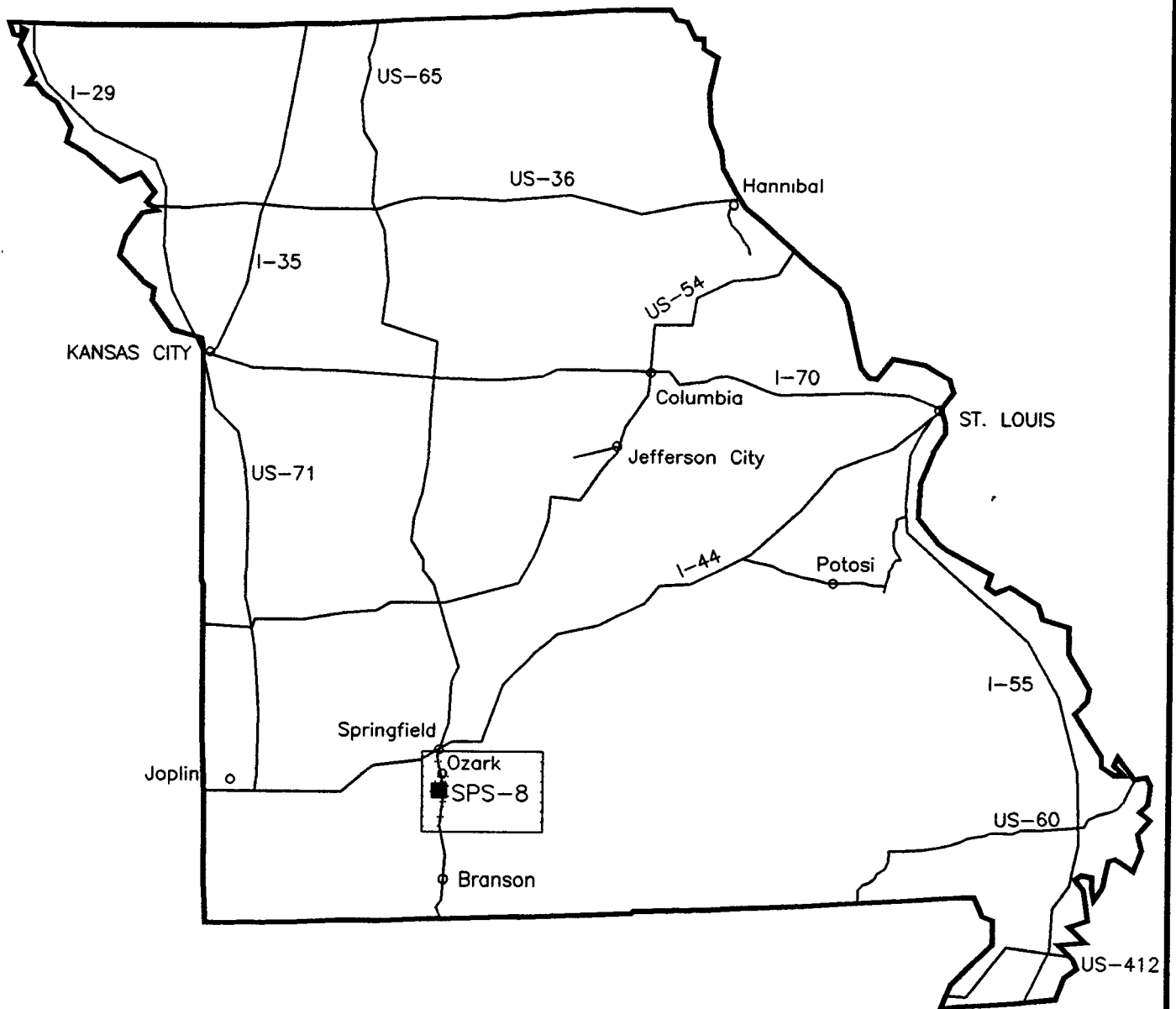


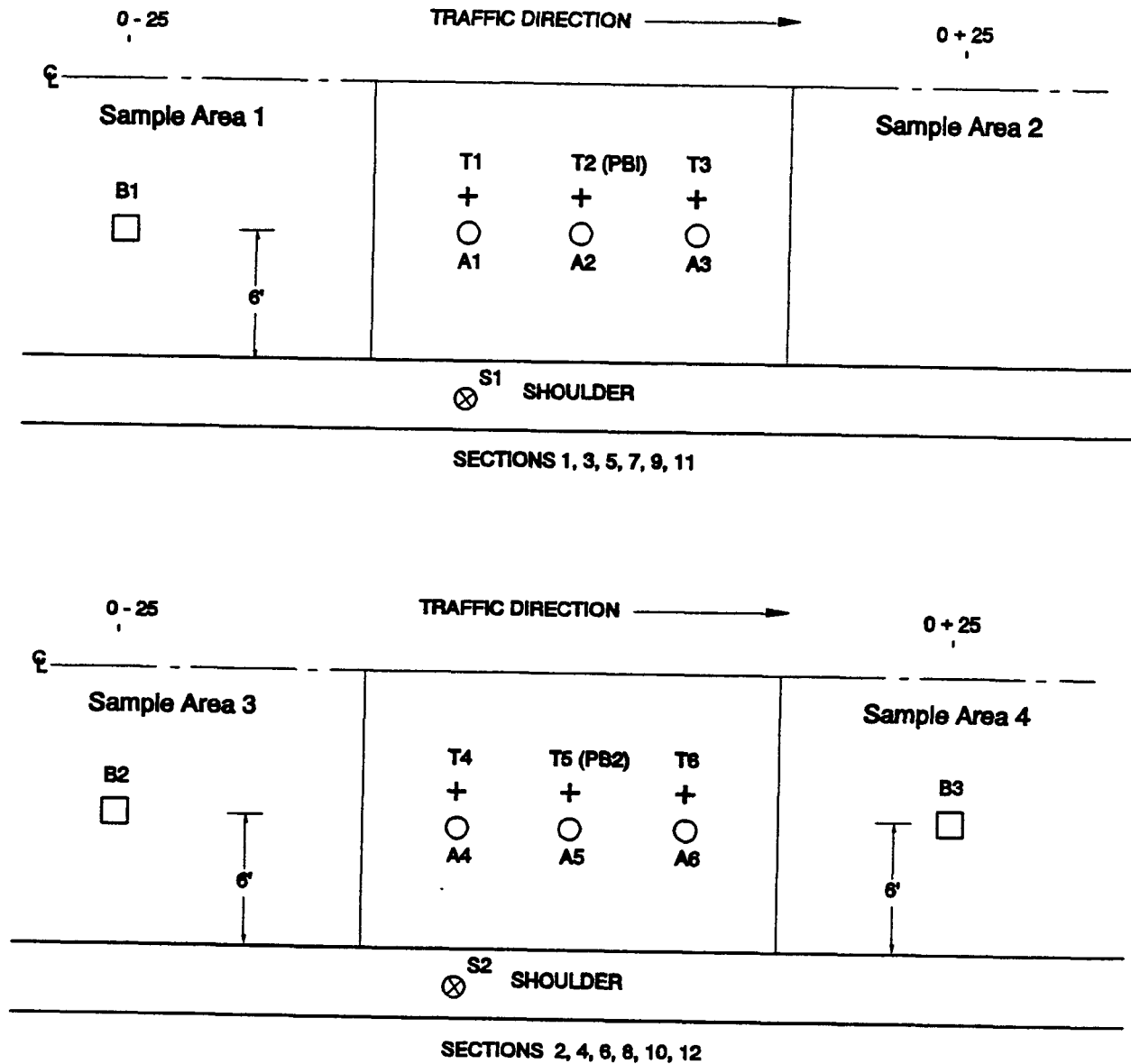
Figure A-1. General Project Location.

Attachment B

Site Layout

Attachment C

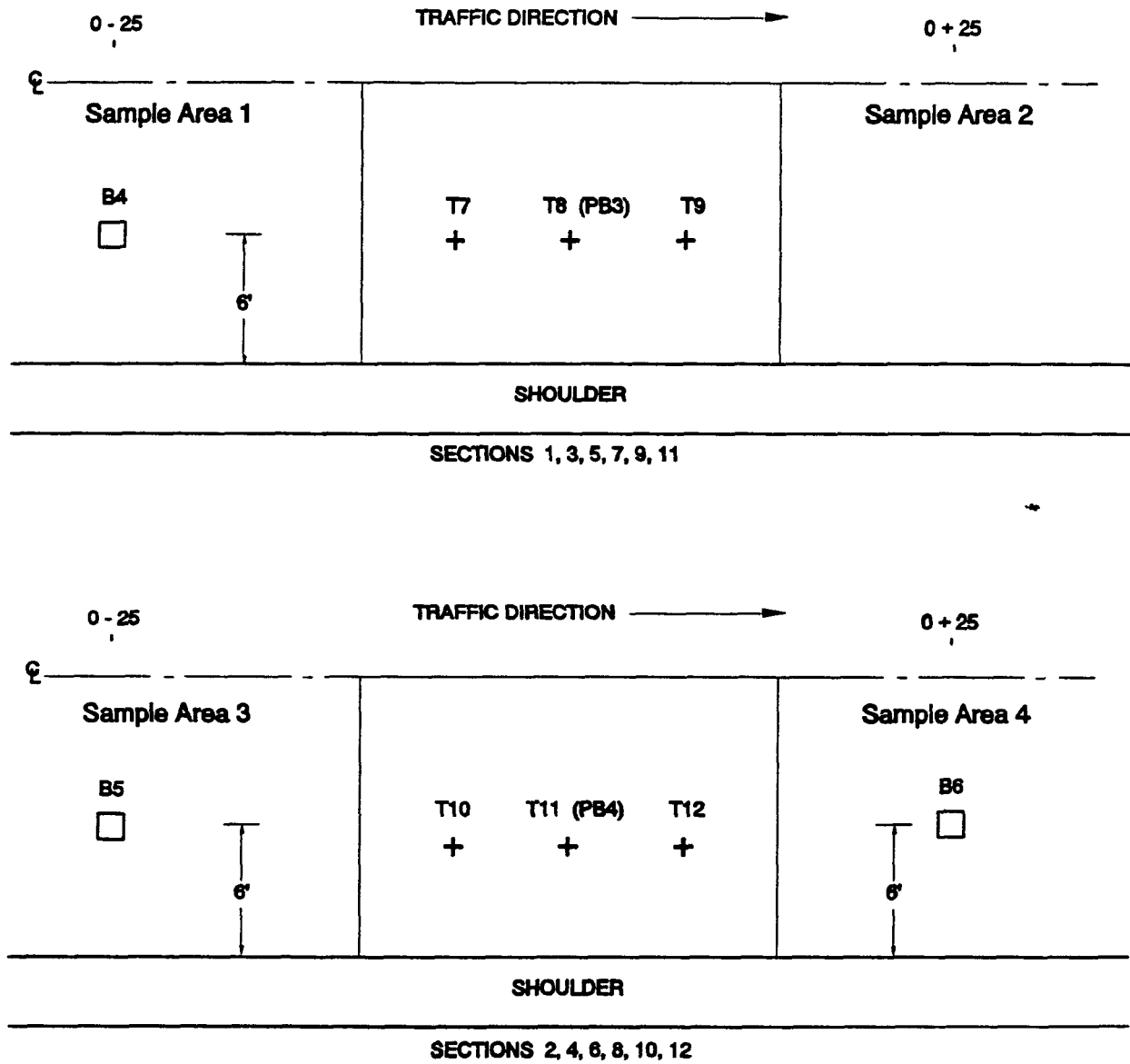
Material Sampling and Testing Plan



LEGEND

- B2 - Bulk sampling location 2 ft x 2 ft to 1 ft below surface
- + T1 - In - place density test location
- A1 - Location of Shelby tube/splitspoon sampling to 4 ft. below surface
- ⊗ S1 - Location of auger probe in shoulder
- PB1 - Location of Plate Bearing Test (Rigid Sections Only)
- 1 in = 25.4 mm
- 1 ft = 0.305 m

Figure C-1. Sampling and testing locations for subgrade



LEGEND

- B5 - Bulk sampling location 1 ft x 1 ft - full layer thickness
- + T10 - In - place density test location
- PB3 - Location of Plate Bearing Test (Rigid Sections Only)
- 1 in = 25.4 mm
- 1 ft = 0.305 m

Figure C-2. Sampling and testing locations for base course.

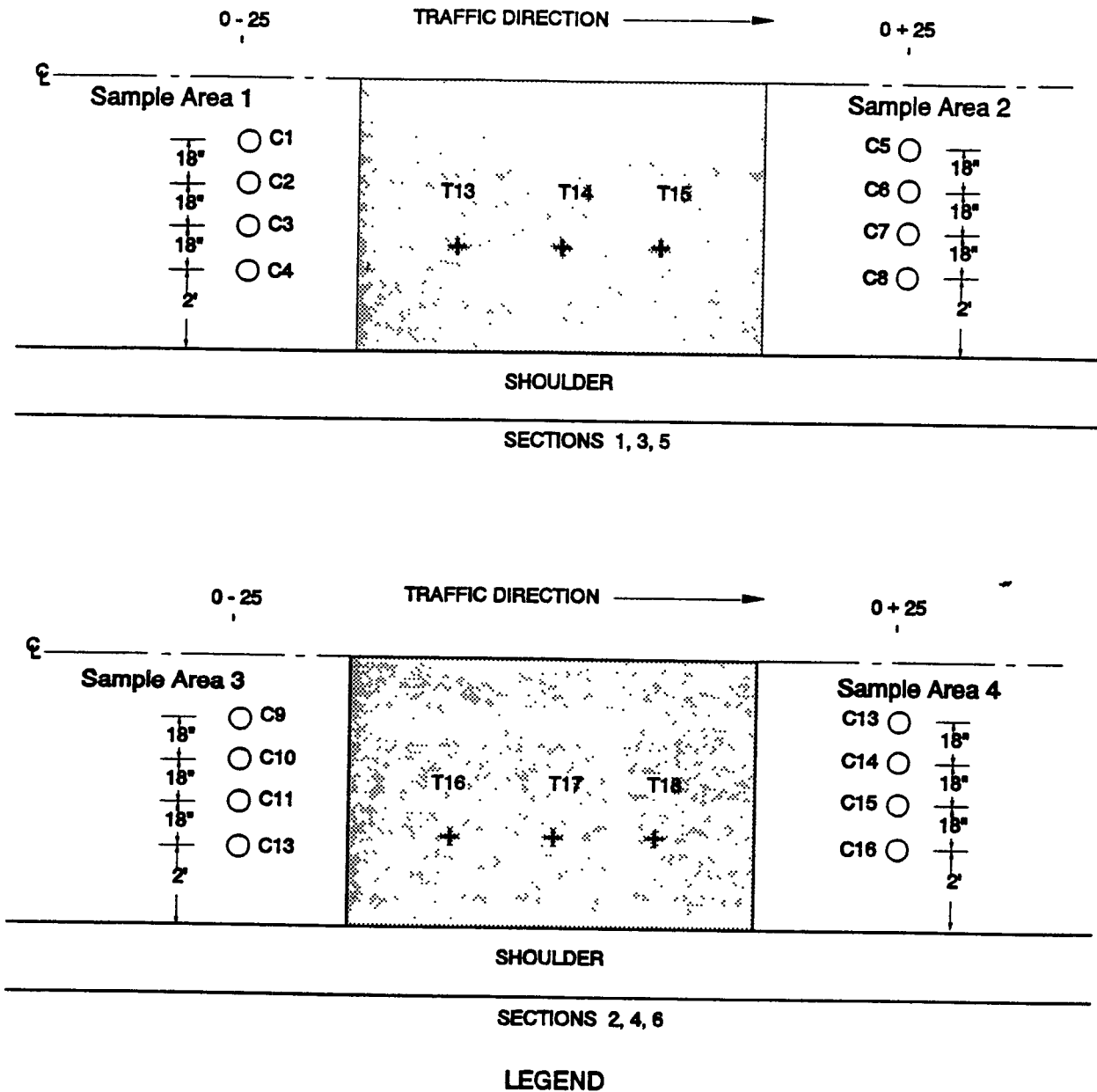
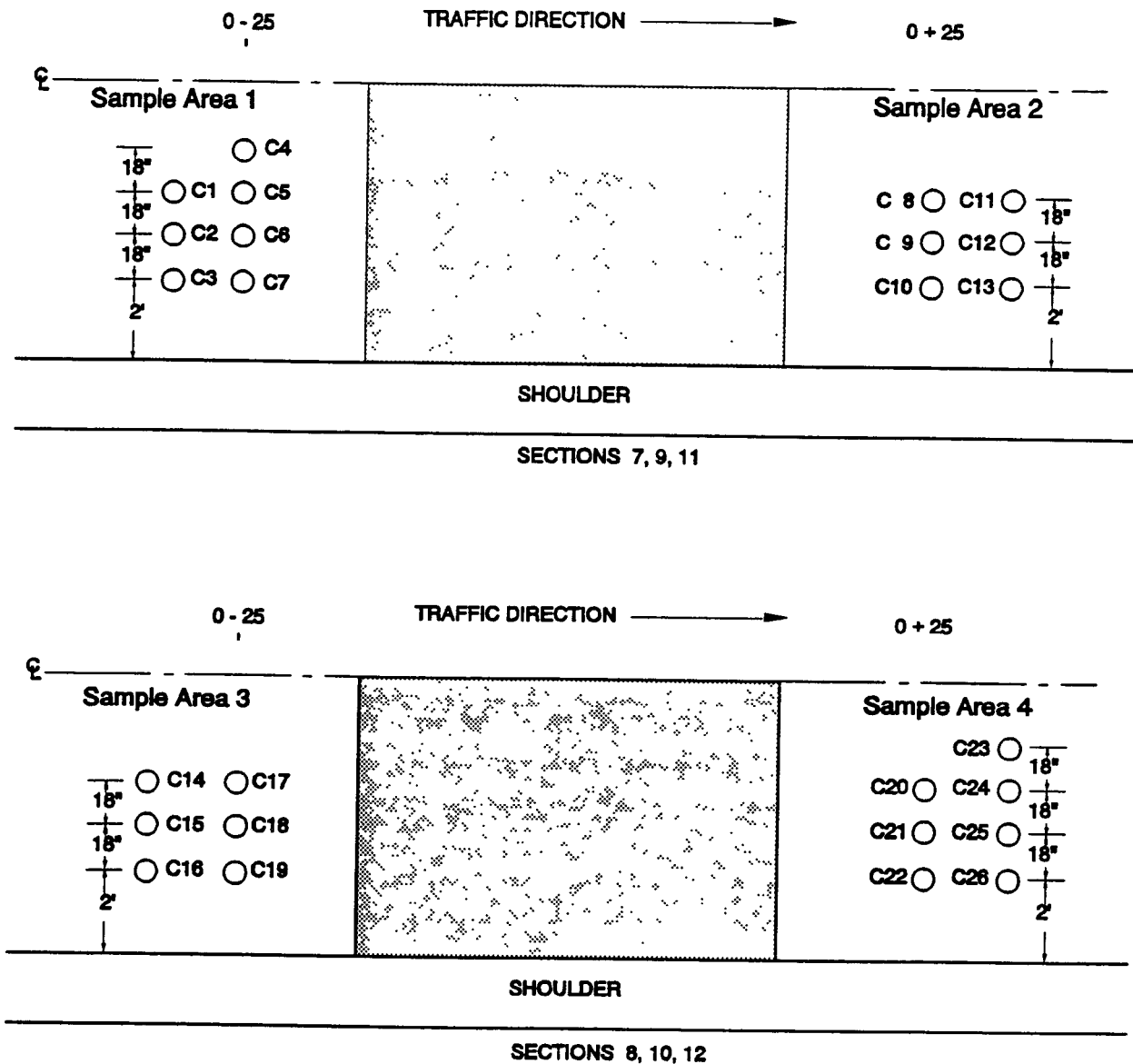


Figure C-3. Sampling and testing locations for AC surface.



LEGEND

○ - 4" Diameter Core of PCC surface

14 day - C1, C10, C20, C5, C14, C23

28 day - C2, C11, C21, C6, C15, C24, C3, C12
C26, C9, C18

1 year - C4, C13, C22, C8, C16, C25, C7, C17, C19

1 in = 25.4 mm

1 ft = 0.305 m

Figure C-4. Sampling and testing locations for PCC surface.

Attachment D

Layer Description and Thickness for Each Section

Table D-1. Material codes.

Material Code	Material Description
111	Fine-Grained Soils: Gravelly Lean Clay
112	Fine-Grained Soils: Gravelly Fat Clay
303	Base-Crushed Stone
700	Asphalt Concrete (AC)
730	Portland Cement Concrete (PCC)

Table D-2. Layer description and thickness for each section.

Test Section	Layer Number	Project Layer	Material Code	Average Layer Thickness (mm)
290801 SB	1	Subgrade	111	N/A
	2	Base-Crushed Stone	303	198
	3	AC Binder	700	71
	4	AC Surface	700	53
290802 SB	1	Subgrade	112	N/A
	2	Base-Crushed Stone	303	292
	3	AC Binder	700	140
	4	AC Surface	700	51
290808 SB	1	Subgrade	112	N/A
	2	Base-Crushed Stone	303	160
	3	PCC	730	269
290807 SB	1	Subgrade	112	N/A
	2	Base-Crushed Stone	303	160
	3	PCC	730	193

Attachment E
Project Deviation Reports

Page 5 of 5 Prepared by Brenda B. Mehnert Date 4-26-2001

Submitted by



ERES
CONSULTANTS

A Division of Applied Research Associates, Inc.

**505 West University Avenue
Champaign, IL 61820-3915**

Phone: (217) 356-4500

Fax: (217) 356-3088

<http://www.eresconsultants.com>

ERES Project No. 95-075-R1